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# SCIENCE

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## THE VALUE OF RESEARCH TO INDUSTRY<sup>1</sup>

THE large chemical industries and, in fact, all branches of chemical technology have been immensely developed during the nineteenth and twentieth centuries, and the achievements of chemistry in the arts and industries have been stupendous and varied. In particular, industrial research—definable as "the catalysis of raw materials by brains"—has been and is being increasingly fostered by chemical manufacturers, and this has led to the accrue-ment of important novelties and improve-ments.

Many excellent résumés of the develop-ment of industrial chemistry during the modern chemical period have appeared in the literature. I shall only remind you that these indicate how industrial chemis-try has been elevated by a continuous in-fusion of scientific spirit, and that manu-facturing, once entirely a matter of em-pirical judgment and individual skill, is more and more becoming a system of scien-tific processes. Quantitative measurements are replacing guesswork, and thus waste is diminished and economy of production insured. In the United States, several de-cades ago, few industrial establishments furnished regular employment to chem-ists, but now American manufacturers are becoming more and more appreciative of scientific research, and the results so far obtained have resulted in far-reaching im-provements. In the production of a metal from its ores, or of benzene derivatives from coal-tar, it is chemistry that points

<sup>1</sup> An address delivered, by invitation, at the in-augural meeting of the session of the Royal Ca-nadian Institute, Toronto, November 7, 1914.